What Is Claimed Is:

1   1.   A method for temporarily increasing an operating frequency of an

2   electronic circuit beyond a maximum sustainable operating frequency,

3   comprising:

4   receiving a request for a higher operating frequency for the electronic

5   circuit;

6   determining a thermal energy level of a cooling system for the electronic

7   circuit; and

8   if the thermal energy level is below a threshold level for a thermal capacity

9   of the cooling system, increasing the operating frequency of the electronic circuit

10   to a frequency that is greater than the maximum sustainable operating frequency

11   for a period of limited duration;

12   wherein the period of limited duration is short enough to ensure that a

13   temperature increase, caused by increasing the operating frequency, does not raise

14   an operating temperature of the electronic circuit above a maximum operating

15   temperature.

1   2.   The method of claim 1, wherein the electronic circuit is a computer

2   system.

1   3.   The method of claim 2, wherein receiving the request for the

2   higher operating frequency involves receiving the request from one of:

3   an application running on the computer system;

4   an operating system of the computer system; and

5   a controller that detects an increase in computational workload by

6   monitoring a current sensor within the computer system.

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1   4.   The method of claim 1, wherein measuring the thermal energy

2   level of the cooling system involves measuring a temperature of a heat sink within

3   the cooling system.

1   5.   The method of claim 1, wherein increasing the operating frequency

2   for the period of limited duration involves increasing the operating frequency for

3   an allotted time.

1   6.   The method of claim 1, wherein increasing the operating frequency

2   for the period of limited duration involves increasing the operating frequency until

3   a command is received to reduce the operating frequency.

1   7.   The method of claim 1, wherein if the thermal energy level of the

2   cooling system is not below the threshold value, the method further comprises

3   increasing the operating frequency of the electronic circuit to the maximum

4   sustainable operating frequency.

1   8.   The method of claim 1, wherein increasing the operating frequency

2   of the electronic circuit additionally involves increasing an operating voltage of

3   the electronic circuit for the period of limited duration.

1   9.   The method of claim 1, further comprising, after the period of

2   limited duration is over, lowering the operating frequency of the electronic circuit

3   to the maximum sustainable operating frequency.

1   10.   The method of claim 1, further comprising lowering the operating

2   frequency of the electronic circuit to a lower power-conserving frequency when

3   the electronic circuit is not busy, whereby the lower power-conserving frequency

4   further decreases the thermal energy of the cooling system and thereby provides a

5   longer period of boosted frequency when needed.

1   11.   An apparatus that temporarily increases an operating frequency of

2   an electronic circuit beyond a maximum sustainable operating frequency,

3   comprising:

4   the electronic circuit;

5   a thermal sensor that is configured to determine a thermal energy level of a

6   cooling system for the electronic circuit; and

7   a controller that is configured to receive a request for a higher operating

8   frequency for the electronic circuit;

9   wherein if the thermal energy level of the cooling system is below a

10   threshold level for a thermal capacity of the cooling system, the controller is

11   configured to increase the operating frequency of the electronic circuit to a

12   frequency that is greater than the maximum sustainable operating frequency for a

13   period of limited duration;

14   wherein the period of limited duration is short enough to ensure that a

15   temperature increase, caused by increasing the operating frequency, does not raise

16   an operating temperature of the electronic circuit above a maximum operating

17   temperature.

1   12.   The apparatus of claim 11, wherein the electronic circuit is a

2   computer system.

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1   13.   The apparatus of claim 12, wherein the controller is configured to

2   receive the request for the higher operating frequency from one of:

3   an application running on the computer system;

4   an operating system of the computer system; and

5   a current sensor within the computer system that is configured to detect an

6   increase in computational workload.

1   14.   The apparatus of claim 11, wherein the thermal sensor is

2   configured to measure a temperature of a heat sink within the cooling system.

1   15.   The apparatus of claim 11, wherein the controller is configured to

2   increase the operating frequency by allotting a time for the increase.

1   16.   The apparatus of claim 11, wherein the controller is configured to

2   increase the operating frequency by sending a command to increase the operating

3   frequency, and then later sending a command to decrease the operating frequency.

1   17.   The apparatus of claim 11, wherein if the thermal energy level of

2   the cooling system is not below the threshold value, the controller is configured to

3   increase the operating frequency of the electronic circuit to the maximum

4   sustainable operating frequency.

1   18.   The apparatus of claim 11, wherein the controller is additionally

2   configured to increase an operating voltage of the electronic circuit for the period

3   of limited duration.

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1   19.   The apparatus of claim 11, wherein the controller is implemented
2   by code that is executing on a processor.

1   20.   The apparatus of claim 11, wherein the controller is implemented
2   by special purpose digital hardware.

1   21.   The apparatus of claim 11, wherein after the period of limited
2   duration is over, the controller is configured to lower the operating frequency of
3   the electronic circuit to the maximum sustainable operating frequency.

1   22.   The apparatus of claim 11, wherein the controller is configured to
2   lower the operating frequency of the electronic circuit to a lower power-
3   conserving frequency when the electronic circuit is not busy, whereby the lower
4   power-conserving frequency further decreases the thermal energy of the cooling
5   system and thereby provides a longer period of boosted frequency when needed.

1   23.   A computer system that is configured to temporarily increase its
2   operating frequency beyond a maximum sustainable operating frequency,
3   comprising:
4   a processor;
5   a memory;
6   a thermal sensor that is configured to determine a thermal energy level of a
7   cooling system for an electronic circuit in the computer system; and
8   a controller that is configured to receive a request for a higher operating
9   frequency for the electronic circuit;
10   wherein if the thermal energy level of the cooling system is below a
11   threshold level for a thermal capacity of the cooling system, the controller is

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12 configured to increase the operating frequency of the electronic circuit to a

13 frequency that is greater than the maximum sustainable operating frequency for a

14 period of limited duration;

15   wherein the period of limited duration is short enough to ensure that a

16 temperature increase, caused by increasing the operating frequency, does not raise

17 an operating temperature of the electronic circuit above a maximum operating

18 temperature.

1   24.   A computer-readable storage medium storing instructions that

2 when executed by a computer system cause the computer system to perform a

3 method for temporarily increasing an operating frequency of an electronic circuit

4 beyond a maximum sustainable operating frequency, the method comprising:

5   receiving a request for a higher operating frequency for the electronic

6 circuit;

7   determining a thermal energy level of a cooling system for the electronic

8 circuit; and

9   if the thermal energy level is below a threshold level for a thermal capacity

10 of the cooling system, increasing the operating frequency of the electronic circuit

11 to a frequency that is greater than the maximum sustainable operating frequency

12 for a period of limited duration;

13   wherein the period of limited duration is short enough to ensure that a

14 temperature increase, caused by increasing the operating frequency, does not raise

15 an operating temperature of the electronic circuit above a maximum operating

16 temperature.

1   25.   The computer-readable storage medium of claim 24, wherein the

2 electronic circuit is the computer system.

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1   26.   The computer-readable storage medium of claim 25, wherein

2   receiving the request for the higher operating frequency involves receiving the

3   request from one of:

4   an application running on the computer system;

5   an operating system of the computer system; and

6   a controller that detects an increase in computational workload by

7   monitoring a current sensor within the computer system.

1   27.   The computer-readable storage medium of claim 24, wherein

2   measuring the thermal energy level of the cooling system involves measuring a

3   temperature of a heat sink within the cooling system.

1   28.   The computer-readable storage medium of claim 24, wherein

2   increasing the operating frequency for the period of limited duration involves

3   increasing the operating frequency for an allotted time.

1   29.   The computer-readable storage medium of claim 24, wherein

2   increasing the operating frequency for the period of limited duration involves

3   increasing the operating frequency until a command is received to reduce the

4   operating frequency.

1   30.   The computer-readable storage medium of claim 24, wherein if the

2   thermal energy level of the cooling system is not below the threshold value, the

3   method further comprises increasing the operating frequency of the electronic

4   circuit to the maximum sustainable operating frequency.

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1   31.   The computer-readable storage medium of claim 24, wherein

2 increasing the operating frequency of the electronic circuit additionally involves

3 increasing an operating voltage of the electronic circuit for the period of limited

4 duration.

1   32.   The computer-readable storage medium of claim 24, further

2 comprising, after the period of limited duration is over, lowering the operating

3 frequency of the electronic circuit to the maximum sustainable operating

4 frequency.

1   33.   The computer-readable storage medium of claim 24, further

2 comprising lowering the operating frequency of the electronic circuit to a lower

3 power-conserving frequency when the electronic circuit is not busy, whereby the

4 lower power-conserving frequency further decreases the thermal energy of the

5 cooling system and thereby provides a longer period of boosted frequency when

6 needed.

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